High-Speed Thermal Characterization of Cryogenic Flows, Phase I

Completed Technology Project (2005 - 2006)

Project Introduction

The John C. Stennis Space Center's primary mission is testing rocket propulsion systems and components for the Space Shuttle and for future generations of space vehicles. Research to develop new instrumentation technologies and techniques for test facility monitoring and control during propulsion testing includes the need for instrumentation to improve reliability and performance of ground test facilities. Current sensors can not survive the harsh conditions (high pressures and high flow rates) that are required for ground based rocket propulsion systems testing. Luna Innovations proposes to develop a high-speed, cryogenic fiber optic temperature sensor housed in a ruggedized, aerodynamic probe to increase sensing capabilities for ground-based rocket testing. Luna will be teaming with the Aerospace Department at a partnering university to develop a materials-compatible housing designed for survivability in high flow and high pressure cryogenic conditions. Computational fluid dynamics (CFD) modeling will be conducted to optimize the aerodynamic design for frequency response and ruggedization of the sensor and housing. Special attention will be given to designing smart features into the sensor, such as self-diagnostics to monitor sensor health, and on-board storage of calibration data.

Primary U.S. Work Locations and Key Partners

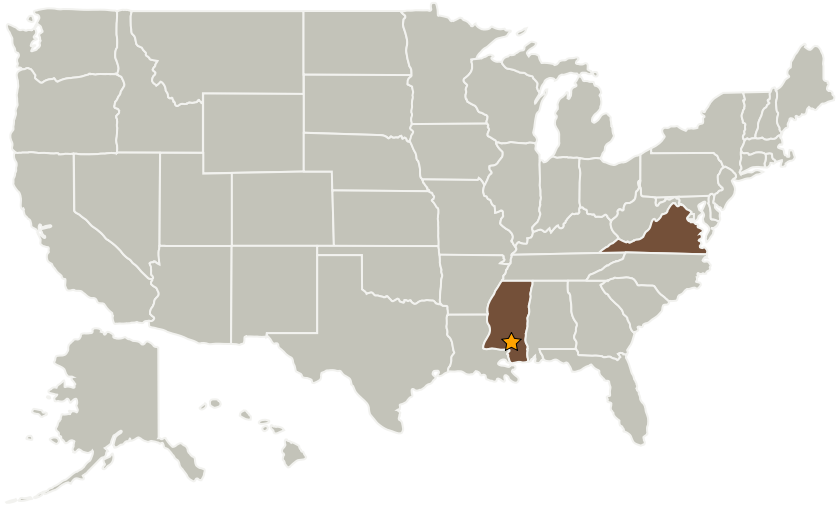

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
Luna Innovations, Inc.	Supporting Organization	Industry	Roanoke, Virginia

Primary U.S. Work Locations	
Mississippi	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.6 Extreme Environments Related to Critical System Health Management